CLAIMS

What is claimed is:

/ 1. A multihop, multi-channel, wireless communication network configured as a daughter network for coupling to a parent network, said communication network comprising:

a hub access-point (HAP) node configured to be coupled to said parent network and configured to engage in outward wireless communication; and

a plurality of active nodes configured to engage in said outward wireless communication with said HAP node over a plurality of outward communication paths, wherein said plurality of outward communication paths each includes at least two outward hops and uses at least two channels; wherein,

scheduled time slots are allocated to said active nodes for transmitting data packets over said plurality of outward communication paths, one time slot is associated with each outward hop, and said time slots are consecutively arranged along said plurality of outward communication paths.

2. A communication network as claimed in claim 1 wherein consecutive time slots are allocated to said active nodes in said outward communication paths beginning with a time slot allocated to said HAP node.

3. A communication network as claimed in claim 1 wherein each of said outward hops has two termini, with one of said two termini being at one of said active nodes.

4. A communication network as claimed in claim 1 additionally comprising at least one inactive node, wherein an

unscheduled time slot is allocated to said active nodes for use in communicating with said at least one inactive node.

5. A communication network as claimed in claim 1 wherein said paths are interleaved so that said scheduled time slots for each of said active nodes are distributed substantially evenly.

6. A communication network as claimed in claim 1 wherein:

each of said plurality of outward communication paths exists for a latency period; and

said time slots are allocated to minimize a total of said latency periods for all of said outward communication paths.

7. A communication network as claimed in claim 1 wherein:

each of said active nodes includes only one transceiver;

said only one transceiver is configured to transmit or receive over a plurality of channels; and

each of said active nodes both transmits and receives over at least one of said plurality of channels.

8. A communication network as claimed in claim 1 wherein:

each of said HAP node and said plurality of active nodes is configured to engage in inward wireless communication over a plurality of inward communication paths, wherein said plurality of inward communication paths each includes at least two inward hops and uses said at least two channels; and

scheduled time slots are allocated to said nodes for transmitting data packets over said plurality of inward communication paths, one time slot is associated with each inward hop, and said time slots are consecutively arranged along each of said plurality of inward communication paths.

9. A communication network as claimed in claim 8 wherein:

consecutive time slots are allocated to said active nodes in said outward communication paths beginning with said HAP node; and

consecutive time slots are allocated to said active nodes in said inward communication paths beginning with outermost active nodes for said inward communication paths.

10. A communication network as claimed in claim 9 wherein:

each of said plurality of outward and inward communication paths exists for a latency period;

a bi-directional-path pair includes outward and inward communication paths that have a common outermost node; and

said time slots are allocated so that the number of coexisting bi-directional-path pair communication paths is minimized.

11. A communication network as claimed in claim 8 wherein:

said communication network additionally comprises at least one inactive node; and

at least two unscheduled time slots are allocated to said active nodes for use in communicating with said at least one inactive node, a first one of said two unscheduled time slots is allocated for transmission from said at least one inactive node, and a second one of said two unscheduled time slots is allocated for reception at said at least one inactive node.

12. A communication network as claimed in claim 1 wherein said HAP node and active nodes are operated in accordance with an IEEE 802.11 standard for wireless local area networks.

13. A communication network as claimed in claim 1 wherein:

a portion of said active nodes forwards data packets toward outermost active nodes of said outward communication paths; and

said portion of said active nodes receives, then transmits said data packets over different channels.

14. A multihop, multi-channel, wireless communication network configured as a daughter network for coupling to a parent network, said communication network comprising:

a hub access-point (HAP) node configured to be coupled to said parent network and configured to engage in inward wireless communication; and

a plurality of active nodes configured to engage in said inward wireless communication with said HAP node over a plurality of inward communication paths, wherein said plurality of inward communication paths each includes at least two inward hops and uses at least two channels; wherein,

scheduled time slots are allocated to said active nodes for transmitting data packets over said plurality of inward communication paths, one time slot is associated with each inward hop, and said time slots are consecutively arranged along said plurality of inward communication paths.

15. A communication network as claimed in claim 14 wherein consecutive time slots are allocated to said active nodes in said inward communication paths beginning with a time slot allocated to an outermost active node in each inward communication path.

16. A communication network as claimed in claim 14 wherein:

each of said plurality of inward communication paths exists for a latency period; and

said time slots are allocated to minimize a total of said latency periods for all of said inward communication paths.

17. A communication network as claimed in claim 14 wherein:

a portion of said active nodes forwards data packets toward said HAP node; and

said portion of said active nodes receives, then transmits said data packets over different channels.

18. In a communication network where a hub access-point (HAP) node communicates with a plurality of active nodes over a plurality of communication paths and wherein said plurality of communication paths each includes at least two hops and uses at least two channels, a method of allocating resources to said active nodes for use in forming said communication paths comprising:

collecting identity data which describes every hop of each communication path;

associating those ones of said communication paths having common first hops together in first-hop sets, and within each of said first-hop sets, ones of said communication paths having common second hops together to form second-hop sets;

disassociating said first-hop sets and said second-hop sets;

assigning time slots to said active nodes so that one time slot is associated with each hop, and said time slots are consecutively arranged along said communication paths; and

sending allocation data to said active nodes, said allocation data identifying assignments of said time slots to said active nodes.

19. A method as claimed in claim 18 wherein:

a bi-directional-path pair includes outward and inward communication paths that have a common outermost node;

said associating activity associates bi-directional-path pairs having active nodes in common; and

said method additionally comprises, after said disassociating activity, splitting said bi-directional path pairs into inward and outward communication paths.

20. A method as claimed in claim 18 wherein:

each of said plurality of communication paths exists for a latency period; and

said disassociating and assigning activities are configured so that said time slots are allocated to minimize a total of said latency periods for all of said communication paths.

21. A method as claimed in claim 18 wherein said assigning activity comprises:

detecting occurrences of interfering ones of said communication paths; and

adding time slots at said occurrences of said interfering ones of said communication paths.

22. A method as claimed in claim 18 wherein said collecting activity comprises:

collecting data which describes data rate requirements for said active nodes;

determining whether said data rate requirements can be fulfilled in a single path; and

specifying a plurality of paths as extending between said HAP node and ones of said active nodes for which said data rate requirements cannot be fulfilled in a single path.

23. A method as claimed in claim 18 wherein:

said HAP node may also communicate with inactive nodes; and

said assigning activity comprises assigning unscheduled time slots to said active nodes for use in communicating with said inactive nodes.

24. A method as claimed in claim 18 wherein:

said communication paths include inward communication paths over which data flows from said active nodes toward said HAP node and outward communication paths over which data flows from said HAP node toward said active nodes;

said assigning activity assigns consecutive time slots to said active nodes in said inward communication paths beginning with outermost nodes in said inward communication paths; and

said assigning activity assigns consecutive time slots to said active nodes in said outward communication paths beginning with said HAP node.

25. A multihop, multi-channel, wireless communication network configured as a daughter network for coupling to a parent network, said communication network comprising:

a hub access-point (HAP) node coupled to said parent network and configured to engage in outward and inward wireless communication; and

a plurality of active nodes configured to engage in said outward and inward wireless communication with said HAP node over a plurality of outward and inward communication paths, respectively, wherein each of said pluralities of outward and inward communication paths includes at least two hops and uses at least two channels; wherein,

scheduled time slots are allocated to said active nodes for transmitting data packets over said plurality of outward and inward communication paths, one time slot is associated with each hop, a first portion of said time slots is consecutively arranged along said plurality of outward communication paths beginning with said HAP node, and a second portion of said time slots is consecutively arranged along said plurality of inward communication paths beginning with outermost ones of said active nodes in said inward communication paths.

26. A communication network as claimed in claim 25 additionally comprising at least one inactive node, wherein a first unscheduled time slot is allocated to each of said active nodes for use in transmitting to said at least one inactive node and a second unscheduled time slot is allocated to each of said active nodes for use in receiving from said at least one inactive node.

27. A communication network as claimed in claim 25 wherein:

each of said communication paths exists for a latency period; and

said time slots are allocated to minimize a total of said latency periods for all of said communication paths.

28. A communication network as claimed in claim 25 wherein:

each of said active nodes includes only one transceiver;

said only one transceiver is configured to transmit or receive over a plurality of channels; and

each of said active nodes both transmits and receives over at least one of said plurality of channels.

29. A resource allocation computer program for use with a multihop, multi-channel, wireless communication network where a hub access-point (HAP) node communicates with a plurality of active nodes over a plurality of communication paths and wherein each of said plurality of communication paths includes at least two hops and uses at least two channels, said computer program comprising:

a first program segment configured to collect identity data which describes every hop of each communication path;

a second program segment configured to sort said communication paths so that said communication paths having common first hops are associated together in first-hop sets, and within each of said first-hop sets, said paths having common second hops are associated together to form second-hop sets;

a third program segment configured to interleave said first-hop sets and said second-hop sets;

a fourth program segment configured to assign time slots to said active nodes so that one time slot is associated with each

hop, and said time slots are consecutively arranged along said communication paths; and

a fifth program segment configured to send allocation data to said active nodes, said allocation data identifying assignments of said time slots to said active nodes; wherein,

said first, second, third, fourth, and fifth program segments are embodied in a computer-readable medium.

30. A computer program as claimed in claim 29 wherein:

a bi-directional-path pair includes outward and inward communication paths that have a common outermost node;

said second program segment sorts bi-directional-path pairs; and

said computer program additionally comprises a sixth program segment configured to split said bi-directional path pairs into inward and outward communication paths, said sixth program segment being invoked after said third program segment.

31. A computer program as claimed in claim 29 wherein:

each of said plurality of communication paths exists for a latency period; and

said third and fourth program segments are configured so that said time slots are allocated to minimize a total of said latency periods for all of said communication paths.

32. A computer program as claimed in claim 29 wherein:

said communication paths include inward communication paths over which data flows from said active nodes toward said HAP node and outward communication paths over which data flows from said HAP node toward said active nodes;

said fourth program segment assigns consecutive time slots to said active nodes in said inward communication paths

beginning with outermost nodes in said inward communication paths; and

said fourth program segment assigns consecutive time slots to said active nodes in said outward communication paths beginning with said HAP node.